Exercise 11 Ordinary Differential Equations
In this exercise you will build the solutions of a set of two ode's using Matlab.

1 How to get started

Double click the Matlab icon. A window will show up, the "Matlab command window".

If it's your first time skip the following line: To those who already know matlab, use the 'quiver' command.

On the left side of the ''Matlab command window" you'll see two arrow heads >>. This is where you type your commands.

Type your name. If you see your name i.e.
>>Dror
then press Enter.
You'll see:
>>Dror
>>
If not move the mouse onto the window and click a left click using the mouse.

2 My first Ode's

We will see the solutions of the equation:

$$\begin{cases} y_1' = y_1 \\ y_2' = y_2 \end{cases} \tag{1}$$

2.1 Instructions

1. Type:
   [y1,y2] = meshgrid(-3:.2:3,-3:.2:3);
   You'll see:
   >>[y1,y2] = meshgrid(-3:.2:3,-3:.2:3);
   Press Enter.

2. Type: py1=y1;
   You'll see:
   >>[y1,y2] = meshgrid(-3:.2:3,-3:.2:3);
   >>py1=y1;
   Press enter.

3. Type: py2=y2;
   You'll see:
   >>[y1,y2] = meshgrid(-3:.2:3,-3:.2:3);
   >>py1=y1;
   >>py2=y2;
   Press Enter.

4. Type: quiver(y1,y2,py1,py2);
   You'll see:
   >>[y1,y2] = meshgrid(-3:.2:3,-3:.2:3);
   >>py1=y1;
   >>py2=y2;
   >>quiver(y1,y2,py1,py2);
   Press Enter.

A new window will show up 'Figure No.1', this is the solution.

3 You're on your own

Repeat the same, this time for other ode's. The only different is in py1 and py2. For instance the commands:
>>[y1,y2] = meshgrid(-3:.2:3,-3:.2:3);
>>py1=2*y1+y2;
>>py2=y1-3*y2;
>>quiver(y1,y2,py1,py2);
solve the ode,

$$\begin{cases} y_1' = 2y_1 + y_2 \\ y_2' = y_1 - 3y_2 \end{cases} \tag{2}$$

4 Exercises

1. Solve and build a solution to:
   $\begin{cases} y_1' = 0y_1 + y_2 \\ y_2' = y_1 + 0y_2 \end{cases}$, $\begin{cases} y_1' = 2y_1 + y_2 \\ y_2' = 0y_1 + 2y_2 \end{cases}$, $\begin{cases} y_1' = y_1 + y_2 \\ y_2' = -2y_1 + y_2 \end{cases}$

2. Build the flow field to the non linear equation that we did in class. Multiplication of two vectors is as follows:
   >>py1=1/3*(y1-y2).*(1-y1-y2);
   That is '.*' .

   Exercise this with all kind of matrices. Its for your own good.